

# CHAPTER 3

## CLASSES OF IETMS

### 3.1 IETM Definitions

As IETMs began to proliferate, so did the methods for converting and presenting digital data. While careful not to inhibit innovation, the military did not want contractor proprietary solutions either. NSWC, Carderock Division, released a document titled “DoD Classes of Electronic Technical Manuals,” which addressed five classes (Class I through Class V) of IETMs based on the source data format of the IETM and its functionality.

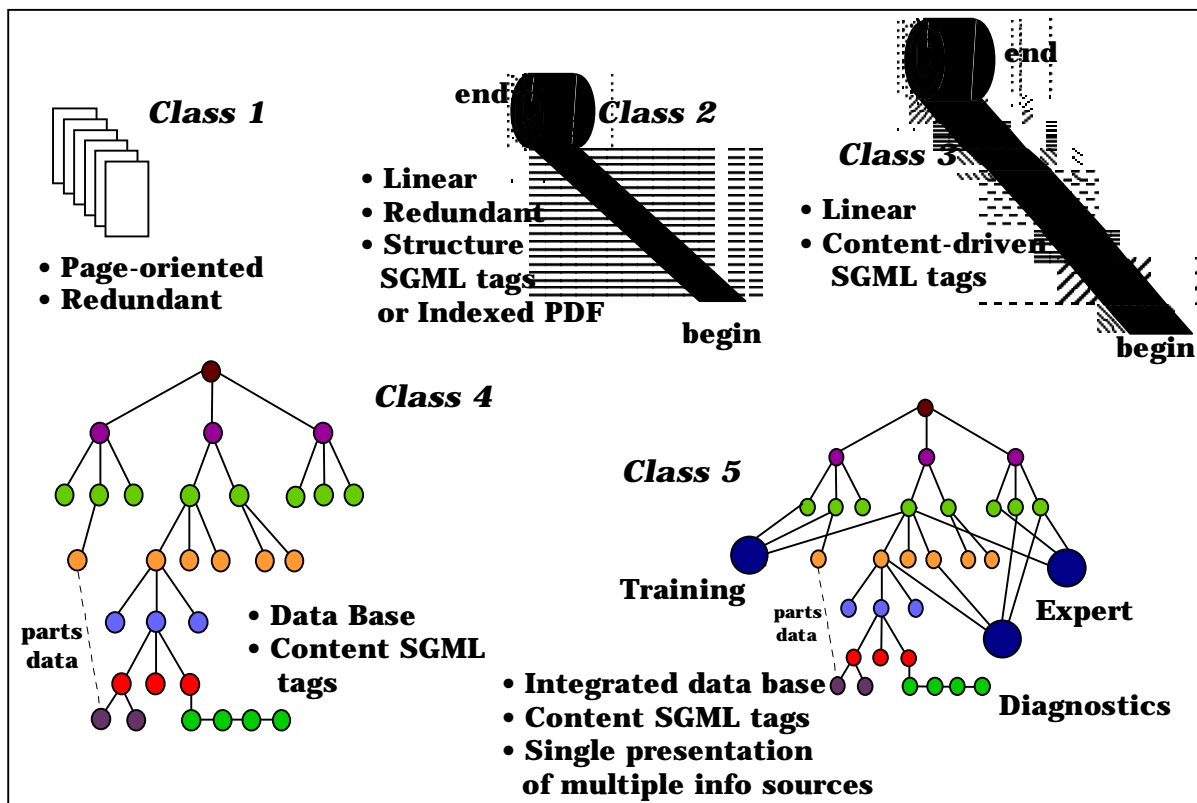
The Classes are defined in fairly general terms that necessarily overlap. They facilitate discussion of options and differences, but they are insufficient to serve as a basis for contractual use (e.g., direct the contractor to prepare a “Class III” manual). The Statement of Work (SOW) or Technical Manual Contract Requirements (TMCR) should specify exact functionality requirements without referring to this set of definitions. The structure of each class is illustrated in Figure 3-1. Table 3-1, found at the end of this chapter, summarizes the key points of each class of IETM, for ready reference.

#### 3.1.1 Class I - Electronically Indexed Page Images

These IETMs include digital page images obtained from raster scanning, using the Navy Implementation of Raster Scanning/Navy Image File Format (NIRS/NIFF). They are intelligently indexed, based on the front matter (i.e., table of contents, list of figures/fold-outs/tables etc.) and rear index using MIL-M-29532. This indexing allows the user to select a topic from front matter and have the corresponding raster page, from the body of the TM, automatically displayed or to create an automatic collation of page changes. Page orientation is retained and can be directly printed.

#### 3.1.2 Class II - Electronic Scrolling Documents

Most of these ASCII-based IETMs conform to Standard Generalized Markup Language (SGML), per MIL-PRF-28001, and link front matter to corresponding material in the body of the TM. (Refer to Appendix A for additional information relating to SGML). They may have additional links to cross-references, tables, figures, etc. and to voice, video, expert systems, or other special external applications. They generally have word search and bookmark capabilities, electronic sticky notes, and may contain raster or vector graphics. The linked manual can be viewed electronically or be printed in compliance with existing military style and format specifications. While MIL-PRF-28001 is the preferred format at this time, other SGML formats (e.g., HyperText Markup Language, HTML) are emerging and provide similar benefits. A second format, Adobe’s Portable Document Format, PDF, is also being used for basic conversions. As discussed in detail in Appendix A, PDF is based on Adobe’s Postscript printer language and allows Class II interactivity. However, the PDF file cannot currently be edited. Consequently, if the Government chooses to maintain the TM data through PDF files, it must first own or have access to the publishing system that generated those files before it can ensure



**Figure 3-1. Graphical Representation of IETM Classes**

that data maintenance and update responsibilities can be transferred between technical manual maintenance activities. Disagreements exist both within and between the services, about classifying PDF as a Class I or Class II document.

### **3.1.3 Class III - Linearly Structured IETMs**

These IETMs have enhanced functionality over Class II. They may have MIL-PRF-28001 or MIL-PRF-87269 SGML tags applied to the ASCII text to allow user interaction through “view packages.” View package requirements can be developed to emphasize functional subjects, such as training, maintenance, and system overview. Being linearly structured, Class III IETM files can be used to print hard-copy TMs. But while all of the data will appear in the proper sequence, the printed copy will not necessarily be in the same format as the traditional “MIL SPEC” manual. Class III IETMs can include optional linkages, such as voice, video, expert systems or special applications. Caution and planning are required, however, if a single database is intended to produce the IETM and publish the hard-copy TM.

### **3.1.4 Class IV - Hierarchically Structured IETMs**

Class IV is a complete departure from the previous classes in which data is structured to support a classical publishing environment based upon sentences, paragraphs, chapters, pages, etc. Class IV data is created or re-authored and then rebuilt into a database. It is then managed as hierarchical objects within a database. In acquisition, Class IV technical data is built into a structured database, using Logistic Support Analysis (LSA) disciplines and formats to create the

database. Data is only created once with no duplication. For legacy TMs, two types of duplicate data are found:

- Identical data is exactly repeated, each time it is found. Examples include WARNINGS, CAUTIONS, NOTES, common procedural steps, graphics, etc.
- Redundant data sets convey the same information, but cannot be substituted for one another. Examples include paragraphs containing essentially the same steps, but they must be managed as individual data sets, because the words within each paragraph provide a different context for each occurrence (e.g., refer to different figures or different preceding paragraphs).

With Class III, identical data can be eliminated. Because re-authoring is avoided to minimize cost or to preserve the ability to print hard-copy, much redundancy remains. For conversion of legacy data to Class IV, data is re-authored to remove its formatting and to rebuild the data into a structured database. Paragraphs or information can be decomposed to simple statements that approximate Logistic Support Analysis Record (LSAR) type of entries at the step level. As the new structure eliminates previous need for duplicate data, the redundant data also is eliminated. The application (view) program then provides the necessary context and transition. The total amount of data being stored and managed is significantly reduced, and multiple updates within the IETM are eliminated. Other SGML based databases found in Class II and III IETMs also have the ability to store data once and apply it many times. They, however, can only share these information objects within a single IETM.

Data linkages in Classes I through III rely on application programs such as scripting or hyperlinking to define the linkages between data. Their Data Base Management System (DBMS) manages the objects, if applicable, but not the structure. For Class IV, building a hierarchical database structure (typically following an LSAR) provides the inherent logic and the linkages among and between data. This principle greatly simplifies the processing of change data and the use of application programs. IETM data modules are structured in conformance with MIL-PRF-87269 and may be represented as SGML-tagged files. All item links are built into the structure of the DBMS. The availability of modules (e.g., figures, text, tables, video, voice clips) enables the user to access information in a highly interactive manner and from a variety of paths. The text is created or edited to have the same "look and feel" as the steps in LSAR entries. IETMs have user-interfaces developed in accordance with MIL-PRF-87268 and provide "frame-," rather than "page-" oriented displays. The Class IV IETM can prompt the user or may directly receive fault code information from which the IETM software determines the appropriate path to display through the database. As its contents are contained in a hierarchically structured database, a Class IV IETM cannot be printed as a unit for distribution in hard-copy form.

A third primary difference between Class IV and the first three IETM classes is that the Class IV product is not bound by a predetermined sequence of presentation. While the sequencing of data may be different for different view packages, Class II and III would have to establish the sequenced data files for each view package; Class IV would create it directly. Class IV IETMs (and Class V IETMs that use Class IVs as a base) have the ability to naturally apply precondition and applicability statements within the IETM database and to "branch on condition found." The program analyzes each condition and brings in the necessary data. This process continues

through to a logical conclusion. By using these features, a Class IV IETM can display only "user specific" data from the database and can tailor presentations based on several input criteria. For example, it may only present certain maintenance choices to a trainee, but present additional choices to a journeyman working with the same equipment configuration and fault indicators. Class IV IETMs can share data sets among users, thereby making data maintenance even more efficient.

Program Offices may encounter contractors with significant investments in legacy publishing systems, legacy IETM software tools, and lack of work force training in or understanding of Class IV production processes. These factors tend to weigh IETM recommendations away from Class IV functionality and toward the "status quo." The persistent comparison of sunk costs, in existing systems with investments needed to execute new technology, generally fails to consider all costs involved in product creation and review, or to consider the potential savings to be achieved throughout the life cycle. Nonetheless, the acquisition of SGML-tagged "linear databases" can provide many end-user features and some of the advantages found in maintaining object-oriented databases through different strategies of use. Whether object oriented or linear, SGML-tagged databases support the longer-term goal of the CALS data integration philosophy.

### **3.1.5 Class V - Integrated Database IETMs**

The Class V IETM combines the functionality and capabilities of an expert system with a technical database. This allows the user to perform tasks more quickly and accurately. The *DSMC IETM Guide* does not address the requirements of expert systems or the efforts needed to achieve the full integration of a multi-functional Class V system. It does address the IETM component of a Class V manual and the interface to an expert system. Class V IETMs allow the subject matter experts (SMEs), in all areas (e.g., troubleshooting, fault isolation, accomplishing repairs, establishing alternate repair paths), to bring their knowledge to the maintenance unit and apply it in a specific situation. The system and equipment diagnostic programs can "talk" directly to the user through the IETM; relatively unskilled technicians can be led through complex procedures. Seldom-used processes and procedures (e.g., annual inspections) can be properly planned and executed without significant research. Programs will also typically analyze the data received and add it to the knowledge base to allow the software to "learn" and apply the knowledge to future analytical processes.

**Table 3-1. IETM Classes**

	Basic ETMs	IETMs			
	Class I	Class II	Class III	Class IV	Class V
	Electronically Indexed Pages	Electronic Scrolling Documents	Linearly Structured IETMs	Hierarchically Structured IETMs	Integrated Database
<b>D I S P L A Y</b>	<ul style="list-style-type: none"> <li>• Full page viewing</li> <li>• Page-turner/Next function</li> <li>• Intelligent index for user access to page images</li> <li>• Page integrity preserved</li> </ul>	<ul style="list-style-type: none"> <li>• Primary view is scrolling text window</li> <li>• Hot-spot access (Hyper-links) to other text or graphics</li> <li>• User selection and navigation aids (key-word search, on-line indices)</li> <li>• Minimal text-formatting for display</li> <li>• User selectable call to (launch) another process</li> </ul>	<ul style="list-style-type: none"> <li>• View smaller logical blocks of text - less use of scrolling</li> <li>• Interaction through dialog boxes</li> <li>• Interaction per Mil-PRF-87268 to extent possible</li> <li>• Text and graphics simultaneously displayed in separate window when keyed together</li> </ul>	<ul style="list-style-type: none"> <li>• View smaller logical blocks of text - very limited use of scrolling</li> <li>• Interaction through dialog boxes with user prompts</li> <li>• Interaction per Mil-PRF-87268</li> <li>• Text and graphics simultaneously displayed in separate window when keyed together</li> </ul>	<ul style="list-style-type: none"> <li>• Class IV IETM functions</li> <li>• Interactive electronic display per Mil-PRF-87268</li> <li>• Multi-function display session</li> <li>• Expert system allows same display session and view system to provide simultaneous access to many differing functions (e.g., supply, training, troubleshooting)</li> </ul>
<b>D A T A F O R M A T</b>	<ul style="list-style-type: none"> <li>• Bit Map (raster)</li> <li>• Indexing and header files (Navy Mil-29532)</li> <li>• MIL-PRF-28001 or Postscript</li> <li>• Generic: C/NDI imaging system formats</li> </ul>	<ul style="list-style-type: none"> <li>• Text - ASCII or PDF</li> <li>• Graphics - whatever viewer supports - e.g., BMP or CALS</li> <li>• Can be SGML tagged - no page breaks (browser)</li> <li>• Access/index often C/NDI dependent with HyperText browser</li> <li>• Generic: C/NDI with HyperText browser</li> </ul>	<ul style="list-style-type: none"> <li>• Linear ASCII with SGML tags</li> <li>• SGML with content vice format tags</li> <li>• Maximum use of Mil-PRF-87269</li> <li>• Generic: SGML tags equivalent to Mil-PRF-87269 tags</li> </ul>	<ul style="list-style-type: none"> <li>• Fully attributed database elements (Mil-PRF-87269)</li> <li>• Mil-PRF-87269 content tags with full conformance with Generic Level Object Out-lines (architectural forms)</li> <li>• Authored directly to DB for interactive electronic output</li> <li>• Data managed by a DBMS</li> <li>• Interactive features authored-in vice added-on</li> <li>• Generic: C/NDI has Mil-PRF-87269 data definition/tags</li> </ul>	<ul style="list-style-type: none"> <li>• IETM info integrated at the data level with other application info</li> <li>• Does not use separate databases for other application data</li> <li>• Identical to Class IV standards for IETM applications data per Mil-PRF-87269</li> <li>• Coding for Expert Systems and AI modules when used</li> <li>• Generic: C/NDI has Mil-PRF-87269 data definition/tags</li> </ul>
<b>F U N C T I O N A L I T Y</b>	<ul style="list-style-type: none"> <li>• Access pages by intelligent index/header info</li> <li>• View page with pan, zoom, etc tools</li> <li>• Limited use of hot-spots</li> <li>• Useful for library or reference use</li> </ul>	<ul style="list-style-type: none"> <li>• Browse through scrolling info</li> <li>• User selection of graphics or hot-spot reference to more text</li> <li>• Hot-spot and cross-reference usually added after original authoring</li> </ul>	<ul style="list-style-type: none"> <li>• Dialog-driven interaction</li> <li>• Logical display of data in accordance with content</li> <li>• Logical NEXT and BACK functions</li> <li>• Useful as interactive maintenance aid</li> <li>• User-selectable cross-refs and indices</li> <li>• Content specific help available</li> </ul>	<ul style="list-style-type: none"> <li>• Dialog-driven interaction</li> <li>• Logical display of data in accordance with content</li> <li>• Logical NEXT and BACK functions</li> <li>• Useful as interactive maintenance aid</li> <li>• User-selectable cross-refs and indices</li> <li>• Content specific help available</li> </ul>	<ul style="list-style-type: none"> <li>• Single viewing system for simultaneous access to multiple info sources</li> <li>• Same as Class IV for IETM functions</li> <li>• Expert system to assist in NEXT functions, based on info gathered in session</li> </ul>